

"Ward Herst"  
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10/26/2007 03:39 PM

To Daniel Wall, Gene Gunn, Jeff Field, Cheryle Micinski

cc victoria.warren, "Charlotte Neitzel", William.Spurgeon,  
"Hockley, Mike", "Paul Rosasco", "Hertz, Sara",  
Rick.Walker

bcc

Subject West Lake Groundwater / Surface Water - 1 of 3 (Again)

1 attachment



10-26-07 Bridgeton OU2 - West Lake Landfill Groundwater and Surface Water Data.pdf

In my original 1 of 3 email, I inadvertently sent you the cover memorandum without the attachments.  
Please use this email instead.

Thanks.

Ward Herst, Managing Director  
(636) 939-9111 phone  
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## MEMORANDUM

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To: Dan Wall  
Copy to: West Lake Respondent Group  
From: Ward Herst  
Date: October 26, 2007  
Subject: West Lake Landfill Groundwater and Surface Water Data

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Pursuant to our recent meeting in Kansas City, attached are maps illustrating groundwater and surface water data collected as part of the West Lake Landfill Operable Unit 1 (OU-1) and Operable Unit 2 (OU-2) RI/FS projects. The maps illustrate data previously provided to EPA. No new data are included.

Groundwater and surface water results for chlorobenzene, benzene, dissolved and total lead, dissolved and total arsenic, and dissolved and total radium are illustrated on attached figures. The locations of two sources of impact to groundwater unrelated to the West Lake Landfill are also identified on the attached figures, consistent with previous submittals to EPA. These include PM Resources, located northeast of the West Lake Landfill, and a Leaking Underground Storage Tank (LUST) site located within the boundaries of Operable Unit 2 but unrelated to the facilities that comprise Operable Unit 2. Summaries previously submitted to EPA regarding the potential relationship between these facilities and the West Lake site are attached. The figures also include the approximate extent of the inward hydraulic gradient that has been established by pumping of about 300 millions gallons per year of groundwater/leachate at the sanitary landfill. As previously described to EPA, the sanitary landfill has been pumping about 300 million gallons per year of leachate/groundwater for approximately 15 years, and is required to maintain a significant inward hydraulic gradient throughout post-closure, which will extend for at least another 29 years.

Brief descriptions of the attached maps are provided below.

- Chlorobenzene: All wells and surface water locations at which chlorobenzene concentrations were below detection are shown in blue. The few isolated locations at which chlorobenzene concentrations were above detection are shown in brown, along with the reported concentration. Only one location exceeded the chlorobenzene MCL.
- Benzene: All wells and surface water locations at which benzene concentrations were below detection are shown in blue. The few isolated locations at which benzene concentrations were above detection are shown in brown, along with the reported concentration. The few benzene detections are located in the general direction of regional groundwater flow from the LUST facility. Surface water in the Earth City Stormwater Retention Pond was sampled for benzene in two locations near the wells with detectable benzene, and benzene was non-detect in the surface water samples.

- Dissolved Lead: There were no detections of dissolved lead for the sampling events shown.
- Total Lead: All wells and surface water locations at which total lead concentrations were below the lead MCL of 0.015 mg/l are shown in blue. The few isolated locations at which total lead concentrations were above the MCL of 0.015 mg/l are shown in brown, along with the reported concentration. Note that the total lead MCL exceedances are isolated. Also, as described above, all dissolved lead concentrations were less than detection, indicating that the total lead exceedances are associated with particulates commonly entrained in unfiltered samples.
- Dissolved Arsenic: All wells and surface water locations at which dissolved arsenic concentrations were below the current arsenic MCL of 0.010 mg/l are shown in blue. The few isolated locations at which dissolved arsenic concentrations were above the current MCL of 0.010 mg/l are shown in brown, along with the reported concentration. Note that the dissolved arsenic MCL exceedances are isolated spatially. Also, the arsenic MCL was 0.050 mg/l during the RI and preparation of the Baseline Risk Assessments for OU-1 and OU-2. If the results are compared to the standards in place at the time of the OU-1 and OU-2 RIs and Baseline Risk Assessments, only three wells exceed the standard of 0.050 mg/l (MW-F3, PZ-304-AS, and PZ-303-AS).
- Total Arsenic: All wells and surface water locations at which total arsenic concentrations were below the current arsenic MCL of 0.010 mg/l are shown in blue. The few isolated locations at which total arsenic concentrations were above the current MCL of 0.010 mg/l are shown in brown, along with the reported concentration. Note also that one of the farthest upgradient wells, located approximately 1,000 feet upgradient of the facility, exhibits a total arsenic MCL exceedance. The arsenic MCL was 0.050 mg/l during the RI and preparation of the Baseline Risk Assessments for OU-1 and OU-2. If the results are compared to the standards in place at the time of the OU-1 and OU-2 RIs and Baseline Risk Assessments, only five wells exceed the standard of 0.050 mg/l (MW-F3, D-14, I-62, PZ-304-AS, and PZ-303-AS). One well yielded a total arsenic concentration equivalent to 0.050 mg/l (S-20).
- Dissolved Radium - All wells and surface water locations at which dissolved radium concentrations were below the radium MCL of 5 pCi/L are shown in blue. Only one well exhibited a dissolved radium concentration above 5 pCi/L (D-6), with an activity of 5.4 pCi/l.
- Total Radium - All wells and surface water locations at which total radium concentrations were below the radium MCL of 5 pCi/L are shown in blue. Only four wells exhibited a total radium concentration above 5 pCi/L. These exceedances ranged from 5.74 pCi/L to 6.33 pCi/L. The slight exceedances are isolated spatially. Two of the four wells with total radium exceedances are located in areas that are not downgradient of either Radiological Area 1 or Radiological Area 2. One of these locations is on the opposite side of the formerly active landfill and the 250-foot deep excavated rock quarry in which the solid waste was placed.



**Global Presence  
Personal Attention**

Mr. Dan Wall  
Remedial Project Manager  
Superfund Division  
USEPA  
901 North 5<sup>th</sup> Street  
Kansas City, Kansas 66101

September 16, 2005

Dear Mr. Wall:

**Responses to Comments, West Lake Landfill Operable Unit 2  
Remedial Investigation Report & Baseline Risk Assessment**

On April 4, 2005, Herst & Associates, Inc. received USEPA comments on the West Lake Landfill Operable Unit 2 Remedial Investigation Report and Baseline Risk Assessment. The comments are reiterated verbatim below, followed by detailed responses.

**GENERAL COMMENTS**

**Comment No. 1:** The purpose and scope should be more explicit on the limits of the investigation and what constitutes the “site”. Section 1.2.2 of the RI describes OU-2 as encompassing the remainder of the West Lake site not included in OU-1, which could be construed to include areas not associated with the landfill areas, e.g., the leaking underground storage tank at the asphalt plant.

**Response:** In response to Comment No. 1, the text has been revised to alter the definition of Site in order to exclude the concrete plant, asphalt plant, and automotive repair facility. The Site will refer to areas where landfill activities have been or are being conducted at the West Lake Landfill, with the exception of Operable Unit 1 Area 1 and Operable Unit 1 Area 2. This language is contained in the December 19, 1994 Administrative Order on Consent, Docket No. Vii-94-0025.

**Comment No. 2:** Some of the inferred hydrogeological pathways for contaminant migration are not made clear. Specifically, the petroleum impacts near monitoring well MW-F2 and the volatile organic compounds in PZ-114-AS are attributed to sources outside the scope of OU 2, but it is not clear from the information provided where the respective sources are located and that they are upgradient from the impacted wells. It would be helpful to show on one of the figures the approximate location of the groundwater divide that is maintained by the active landfill leachate collection system. To what extent do any of the closed landfill areas fall outside the capture zone?

**Response:**

***MW-F2 and Inactive Landfill***

As described in the Work Plan, page 2-10, “*The currently active sanitary landfill includes a leachate collection system (Section 2.5.2) which maintains an inflow of bedrock groundwater toward the landfill. The inflow creates a local water table depression around the landfill.*” The December 1997

Site Characterization Summary Report, page 7, states that “...leachate collection from the active landfill is the major hydrogeologic feature at the site. Leachate collection has maintained an inward hydraulic gradient from the adjacent Salem, St. Louis/Upper Salem, and alluvial hydrogeologic units that was developed when the limestone quarry created a local hydraulic sink by excavating below the water table.” The RI Report dated June 2000, page 38, states that “An alluvial groundwater divide apparently exists west of the active landfill, as would be expected based on regional data. East of the divide, groundwater flow is towards the active landfill. West of the divide, alluvial groundwater flow is west/northwest towards the Missouri River.”

Consistent with comments provided in various submittals associated with Operable Unit 1, there are only minor differences in water levels in the western portion of the site. For example, Figure 3-33 of the June 2000 RI Report indicates an April 3, 1996 water level of about 429.85 feet (ft) above mean sea level (msl) in alluvial well S-88 located near the asphalt plant, compared to slightly lower water levels of 429.85 ft msl in well MW-104 and 429.77 ft msl in well PZ-303-AS, each of which monitors the alluvium near MW-F2, approximately 1,200 feet southwest of S-88. The difference in water levels is therefore 0.08 feet or less over approximately 1,200 feet, indicating a slight gradient from the asphalt plant area toward the MW-F2 area. Figure 3-35 indicates a July 12, 1996 water level of 434.24 ft msl in well S-88 compared to 434.06 ft msl in well MW-104, 434.06 ft msl in MW-F2, and 434.23 ft msl in PZ-303-AS. The difference in water levels ranges from 0.01 to 0.18 feet using these data, indicating a slight gradient from the asphalt plant area toward the MW-F2 area. On other occasions the water levels indicate a slight gradient from the MW-F2 area toward the asphalt plant area (see Figures 3-32 and 3-34 of the RI Report, for example).

Given the variation in water levels across the alluvium at the site, it is not possible to develop a consistent approximation of the groundwater divide. However, the leachate levels maintained in the active landfill are substantially lower than the alluvial water levels, and groundwater seeps were observed throughout the walls of the former mine excavation during landfill operations, indicating groundwater flow into the former excavation and accordingly a groundwater divide at some distance away from the landfill.

With regard to the closed landfill areas and their relationship to the groundwater divide, the extent to which the inactive landfill is within or outside of the groundwater divide can be estimated using the existing data. For example, Figure 3-31 of the RI Report indicates a water level of 432.07 ft msl in well S-82 located at the western edge of the inactive landfill, compared to a water level of 432.04 ft msl in well S-88 and 431.27 ft msl in well I-73 located adjacent to the active landfill. These data would suggest that the inactive landfill is contained within the capture zone of the active landfill. Similar relationships hold for Figures 3-33 through 3-36. Using these data points, one could conclude that the majority of the inactive landfill area is contained within the capture zone of the active landfill.

In summary, the data indicate the potential for the MW-F2 area to be hydraulically downgradient of the asphalt plant area at least occasionally. The data further indicate that the majority of the inactive landfill is contained within the capture zone of the active landfill. However, the conclusions are based on water level differences of tenths or hundredths of feet over horizontal distances of over 1,000 feet. Appropriate discretion should be applied to the conclusions based on the low gradients. Please refer to response to Comment No. 5 for additional details regarding the leaking underground storage tank investigation near the asphalt plant.

**PZ-114-AS**

Subsequent to submittal of the RI Report in 2000, additional data have been obtained regarding potential upgradient sources to PZ-114-AS. Available data include March 2003 water level from the PM Resources, Inc. property and May 2003 water level data from the Bridgeton Landfill. Attachment 1 includes March 2003 water level data for the PM Resources, Inc. property. Figure 1 illustrates the general direction of groundwater flow. Figure 2 focuses on the PZ-114-AS area and indicates that the direction of flow is from the PM Resources property toward PZ-114-AS. Additional discussion is provided in response to Comment No. 7 below.

**Comment No. 3:** As written the exposure assessment in the Baseline Risk Assessment (BRA) limits the plausible receptor scenarios based on the existence of the restrictive covenants that prohibit residential development and groundwater use. It is appropriate for the BRA to rule out exposure scenarios based on reasonably anticipated land use but not based on the existence of use restrictions. That is because the use restrictions are a de facto remedy and the baseline risks are those that would exist if the remedy was not maintained. The Human Health Assessment should be revised accordingly.

**Response:** The Baseline Risk Assessment Report has been revised to indicate that exposure scenarios are based on reasonably anticipated land use.

**REMEDIAL INVESTIGATION REPORT**

**Comment No. 4: 2.4.2 Regional Wells, pg. 12.** What is meant by the nearest drinking water well is “reportedly” located one mile north? Describe the sources of information used to determine what wells exist and update with respect to any nearby wells as appropriate. Provide more specific information about the locations of the nearest wells.

**Response:** Various submittals made as part of OU-1 and OU-2 have relied on a previous evaluation of nearby wells, as described in Foth and Van Dyke, 1989. Section 2.4.2 of the OU-2 Remedial Investigation Report also provides the Foth and Van Dyke reference. Foth and Van Dyke, 1989 provided details regarding a field evaluation of nearby wells. Because the field evaluation post-dated State of Missouri requirements for well registration that took effect in 1986, the results have been considered comprehensive and reliable and have therefore been referenced in various submittals associated with Operable Units 1 and 2 of the West Lake Landfill.

In response to the Comment, the State of Missouri was contacted and provided a listing of registered wells in the area of the Bridgeton Landfill. The State of Missouri information is presented in Attachment 2 to this response letter. The State of Missouri provided a list of registered wells in T46N, R5E and T47N, R5E, which encompasses approximately 5 miles in all directions from the Bridgeton Landfill. The locations of the registered wells are illustrated on Figure 3. Note that the closest registered well is approximately 1 mile northeast of the landfill. This particular well is drilled 245 feet deep. Given the geology of the area, the depth indicates a bedrock completion. The closest well that appears to be completed in alluvium is approximately 2.5 miles south of the landfill. Areas south of the landfill are upgradient of the landfill. There are no registered wells located between the Bridgeton Landfill and the Missouri River in the direction of regional groundwater flow.

Additional information is presented in response to Comment No. 10 below.

**Comment No. 5: 4.2.6 Petroleum Impacts near MW-F2, page 51.** This is not clear on the implied relationship between the impacts near MW-F2 and the LUST. Is the LUST located west of the groundwater divide as would be necessary for it to be upgradient? Some description of the ongoing investigation or corrective action associated with the LUST would be appropriate.

**Response:** In response to the Comment, Freedom of Information Act (FOIA) requests were made to various regulatory agencies in Missouri. The response information is presented in Attachment 3. A summary of the response information is included in Attachment 3. Based on the available information, the Leaking Underground Storage Tank (LUST) investigation at the asphalt plant began in 1993. Soil sampling conducted during removal of a 10,000 gallon underground storage tank that had been used to contain diesel fuel yielded Total Petroleum Hydrocarbon (TPH) concentrations as high as 13,270 mg/kg, with benzene, toluene, ethylbenzene, and xylenes also present. Soil concentrations were in excess of soil cleanup levels. By the end of 1993, groundwater monitoring wells had been installed in the asphalt plant area, and some of the wells exhibited floating free product on top of the groundwater. Groundwater TPH concentrations were as high as 748,593 mg/l. Measured floating product thickness has exceeded 3.7 feet. Between 1994 and 2001 some product recovery occurred; however, various letters from the MDNR noted that the extent of groundwater contamination had not been completely defined, and more aggressive product recovery was needed. Letters of Warning were issued from the MDNR to the asphalt facility owner. As of March 29, 2005, the MDNR issued a denial letter to a February 1, 2005 Work Plan for additional site characterization activities, noting that the Work Plan was incomplete and did not provide basic information required for a review of the Plan.

Given that the asphalt plant LUST investigation has been ongoing for approximately 12 years, with leakage beginning at some unknown time prior to tank removal in 1993, that floating product thickness as high as 3.7 feet has been observed, that corrective actions have moved at a pace slower than satisfactory to the MDNR, and that the asphalt plant area is apparently upgradient of the MW-F2 area at least occasionally (see Response to Comment No. 2 above), it is reasonable to conclude that the asphalt plant area is a potential source for some or all of the petroleum impacts in the MW-F2 area.

**Comment No. 6: Table 4-7 & 4-8.** We assume GW-S-80, GW-I-50, and GW-300-AS, for example, are shown on the map as S-80, I-50, and PZ-300-AS. In Table 4-7, the unfiltered Gross Alpha and Gross Beta values are  $5.61 \pm 9.5$  and  $53.1 \pm 6.2$  respectively. In Table 2.4 of BRA, the values are  $56.1 \pm 9.5$  and  $53.1 \pm 6.2$  respectively. Based on a check with other tables it appears that the table in the RI may be in error. These levels appear to exceed alluvial background levels in other wells by an order of magnitude and do not appear to be supported by the isotope results. Some rationale should be provided to account for this.

**Response:** The groundwater sample designations utilized in the Remedial Investigation Report are consistent with the EPA-approved RI/FS Work Plan, Appendix A, Field Sampling Plan, Section 5, Sample Designation. As noted in the Field Sampling Plan, groundwater samples would be indicated with a prefix "GW-". Page 5-1 of the Field Sampling Plan provides an example. Page 5-1 indicates that GW-201-SS would refer to a groundwater sample collected from PZ-201-SS. Similar designations have been used in prior Operable Unit 2 report submittals.

As clarification, EPA Comment No. 6 refers to results for monitoring well S-80 from a December 1995 sampling event conducted by Golder Associates Inc. as part of OU-2 characterization activities. Well S-80 is located approximately 1,000 feet upgradient of the West Lake Landfill. The value of  $5.61 \pm 9.5$  on Table 4-7 of the Remedial Investigation Report appears to contain a typographical error. As noted in the EPA comment, the correct value should be  $56.1 \pm 9.5$ . Other relatively high gross alpha and



gross beta values have been reported in groundwater samples collected near the landfill, including other samples collected from well S-80 by other investigators. As described in the November 1996 “Groundwater Conditions Report for Areas 1 and 2” prepared by McLaren Hart Environmental Engineering Corporation (McLaren Hart) on behalf of Operable Unit 1, a groundwater sample collected by McLaren Hart personnel from well S-80 yielded a gross alpha activity of  $285 \pm 46$  pCi/l. Other background wells with relatively high gross alpha activities include a value of 101 pCi/l for monitoring well MW-106 (August 1994 RI/FS Work Plan for Operable Unit 1) and 202 pCi/l for MW-107 (June 26, 1990 Phase II Investigation Final Report, Ford Financial Services; Attachment 4 to this response letter), both of which are located near monitoring well S-80 and are greater than 1,000 feet upgradient of the Bridgeton Landfill. Similarly, relatively high gross beta values greater than 50 pCi/l have been reported in a number of wells near the landfill. For additional information, please refer to the August 1994 RI/FS Work Plan for Operable Unit 1.

As stated on page 50 of the Operable Unit 2 Remedial Investigation Report, “No source of radioactivity in OU-2 has been identified or is suspected. Based on the radiological data collected as part of the OU-2 RI, groundwater quality appears to reflect natural radioactivity.”

#### Supplemental Sampling

**Comment No. 7:** The Monthly Progress Reports for July and February 2004 describe the results of the supplemental sampling. The reports describe an off-site facility that may be the source of volatile organic compounds found in PZ-114-AS. It would be useful to provide the specific location of the facility and the former catchment system. Its “upgradient” position is presumably dependant on it being located inside the capture zone of the landfill pumping wells, but this relationship is not presented.

**Response:** Subsequent to submittal of the RI Report in 2000, additional information has been obtained regarding the upgradient potential source of VOCs at PZ-114-AS. Following is a more complete description of the facility in question.

PM Resources, Inc. is located across St. Charles Rock Road to the north of Bridgeton Landfill and more importantly, across the street from well 114-AS. A document titled “RCRA Operation & Maintenance Groundwater Monitoring Field Audit Report” compiled by the Missouri Department of Natural Resources (MDNR), Air and Land Protection Division, Environmental Services Program and submitted on March 12, 2003 to the MDNR-Air and Land Protection Division-Hazardous Waste Program (a copy of which is included as Attachment B to this response letter) provides relevant details. According to the March 12, 2003 document, the Environmental Services Program performed a field audit at the PM Resources site in support of MDNR’s agreement with the U.S. Environmental Protection Agency to conduct Groundwater Compliance Monitoring Program inspections Resource Conservation and Recovery Act facilities in Missouri. According to the Report mentioned above, PM Resources is a facility that produces a wide variety of animal health care products including pharmaceuticals, medical feeds, rodenticides, sanitizers, cleaners, and pesticide products. The facility has been producing these types of products since 1970. The 2003 report states that a catchment system was utilized as part of the production process. The 2003 report does not discuss specific details regarding the catchment system. The 2003 report states that in September 1994 the owner removed the catchment system. Upon removal of the system, it was revealed that a release of hazardous chemicals had occurred. The chemicals released from the catchment system included petroleum products such as benzene, toluene, ethylbenzene, and xylenes (BTEX) along with some of their volatile breakdown components. Contaminants of concern at the PM Resources, Inc. site are BTEX and



volatile by-products involved with the removal of the catchment system and pesticides and herbicides that may have been released during the facility's production history. As described in a May 2005 report titled "Selection of Chemicals of Concern in Groundwater, PM Resources, Inc.", a copy of which is included as Attachment 5, volatile organic chemicals of concern in groundwater at the PM Resources facility include the following, along with their maximum detected concentrations:

- 1,2,3-trimethylbenzene (60.4 ug/l)
- 1,2,4-trimethylbenzene (370 ug/l)
- 1,3,5-trimethylbenzene (3.7 ug/l)
- acetone (4,000 ug/l)
- benzene (13 ug/l)
- carbon disulfide (489 ug/l)
- chlorobenzene (11,000 ug/l)
- ethylbenzene (560 ug/l)
- methyl tert-butyl ether (5,650 ug/l)
- nitrobenzene (25 ug/l)
- tetrahydrofuran (3,750 ug/l)

The following table summarizes the VOC detections at PZ-114-AS:

Summary of VOC Detections at PZ-114-AS			
Sampling Date	Benzene (ug/L)	Chlorobenzene (ug/L)	1,4-Dichlorobenzene (ug/L)
8/25/1997	<5	7	<5
11/10/1997	<5	5.1	<5
2/16/1998	<5	<5	<5
5/27/1998	<5	<5	<5
11/12/1998	<5	7.2	<5
5/19/1999	<5	<5	<5
11/19/1999	<5	<5	<5
5/23/2000	<5	<5	<5
11/13/2000	<5	<5	<5
5/15/2001	<5	7.7	<5
11/7/2001	<5	5	<5
5/21/2002	<5	130	<5
7/24/2002	NA	150*	NA
11/19/2002	<5	120	5.5
5/28/2003	<5	110	6.2
11/20/2003	6.1	120	14
5/11/2004	5.4	130	18
11/17/2004	<5	96	11
05/25/05	<5	102	12.2

\*Denotes Confirmation Sampling

Methane gas was monitored in the headspace of PZ-114-AS and adjacent deeper well PZ-115-SS during the November 2003 and May 2004 routine groundwater compliance monitoring events for the

Bridgeton Landfill. Methane was detected in PZ-114-AS during the November 2003 sampling event, but methane was non-detect in the PZ-114-AS headspace during the May 2004 sampling event.

A map showing the location of the PM Resources facility in relationship to the Bridgeton Landfill is included as Figure 1 to this response letter. Figure 1 also includes potentiometric surface contours using water level data collected in wells at the PM Resources facility and the Bridgeton Landfill. As shown on Figure 1, groundwater flows from the PM Resources facility toward the Bridgeton Landfill and the PZ-114-AS location.

Given that benzene and chlorobenzene were detected in groundwater at both the PM Resources facility and PZ-114-AS, with concentrations much higher at the PM Resources facility than at PZ-114-AS, the PM Resources facility appears to be the source of benzene and chlorobenzene detected at PZ-114-AS. The identified direction of groundwater flow from the PM Resources facility toward the Bridgeton Landfill and PZ-114-AS provides support for this conclusion.

1,4-dichlorobenzene has been detected sporadically at PZ-114-AS, but is not detected in groundwater at the PM Resources facility. 1,4-dichlorobenzene is a daughter product of 1,2,3-trichlorobenzene and 1,2,4-trichlorobenzene, neither of which has been detected at the PM Resources facility. 1,4-dichlorobenzene is also a daughter product of 1,2,3,4-tetrachlorobenzene, which has not been analyzed at the PM Resources facility. It appears that 1,4-dichlorobenzene at PZ-114-AS could be related to the PM Resources facility or to landfill gas. It should be noted that the Maximum Contaminant Level for 1,4-dichlorobenzene (AKA paradichlorobenzene or p-dichlorobenzene) is 75 ug/l, and the maximum detected concentration in PZ-114-AS is 18 ug/l. The maximum detected concentration of 1,4-dichlorobenzene in PZ-114-AS is therefore about 4 times lower than the MCL.

**Comment No. 8:** The reports refer to two supplemental alluvial wells identified as PZ-303-AI and PZ-303-AS. We don't find PZ-303-AI on the maps. Perhaps the intent was to refer to PZ-304-AI and PZ-304-AS?

**Response:** The intent was to refer to PZ-302-AS and PZ-302-AI. The tables included in the referenced monthly reports are accurate. The text contained the inappropriate summary reference. The corrected sentence in each of the two referenced monthly reports should read, "Of the five supplemental alluvial wells that could be sampled, two (PZ-302-AI and PZ-302-AS) were not included in 1997 sampling."

## BASELINE RISK ASSESSMENT

**Comment No. 9:** Section 2.2.1, pg 2.2. Figure 3 is cited here but it doesn't seem illustrative of any of any of the discussion points.

**Response:** The figure reference has been modified to illustrate the discussion points.

**Comment No. 10:** Section 2.7.5 Water Supply Wells, pg. 2-6. More detailed information on nearby wells is should be provided. See comments 3 above.

**Response:** Two water supply well investigations have been completed subsequent to submittal of the Remedial Investigation Report and Baseline Risk Assessment in 2000 and 2001, respectively. A May 2005 report titled "Evaluation of Groundwater Use Pathway" was prepared for the PM Resources facility by Risk Assessment Management Group, Inc. The "Evaluation of Groundwater Use Pathway" report includes an evaluation of public water supply wells near the PM Resources site (and therefore

near the adjacent Bridgeton Landfill). A copy of the May 2005 report is included as Attachment 5 to this response letter. As discussed in the “Evaluation of Groundwater Use Pathway” report, the nearest public water supply wells are in the alluvium across the Missouri River, more than four miles from the site. The location of private wells was also evaluated, and the “Evaluation of Groundwater Use Pathway” report concluded that the closest private well installed after 1986 is more than 3 miles from the PM Resources site. The date of 1986 represents the Water Well Drillers Law, which required submittal of well drilling logs to a centralized State of Missouri database. The “Evaluation of Groundwater Use Pathway” report identifies nine older wells within approximately 1 mile of the site. The reported date of well installation for these nine wells ranges from 1924 to 1957. These nine wells are installed at depths ranging from 197 feet below ground surface to 915 feet below ground surface, all within bedrock rather than alluvium.

Herst & Associates, Inc. also obtained information regarding private wells near the landfill. Please refer to response to Comment No. 4.

**Comment No. 11:** Section 2.7.7.1 Current Land Use, pg. 2-7. Here and elsewhere the wording appears, change “precluded” to “prohibited”.

**Response:** Agreed.

**Comment No. 12:** Section 4.1.5 Potential Human Receptors, pg. 4-5, top of the page. Should this reference be to the conceptual model in Figure 6?

**Response:** Yes, the reference should be to Figure 6.

**Comment No. 13:** Section 4.1.5 Potential Human Receptors, pg. 4-5 through 4-6. Several subsections with the same name and covering similar material are repeated. Clarify the reasoning or consolidate this information.

**Response:** The information has been consolidated.

Sincerely,

Herst & Associates, Inc.

Ward Herst, PG  
Managing Director

Cc: Victoria Warren – AWIN  
Mike Hockley – Spencer, Fane, Britt & Browne  
Rod Bloese – Allied  
Jill Bruss - Missouri Department of Natural Resources  
Rick Walker – Bridgeton Landfill, LLC.  
Paul Rosasco - Engineering Management Support, Inc.

## **TIMELINE FOR MARYON INDUSTRIES LUST INVESTIGATION**

In a May 5, 1993 letter from MDNR addressed to ADR Environmental regarding Westlake (ESP File No. LU3874), the MDNR noted that it had received a Spill Report #04223-KT-1612 and had determined that a petroleum release occurred. The May 5, 1993 letter stated that a site assessment report was due within 45 days. An attachment to the May 5, 1993 letter indicated that gas, diesel, and waste oil were spilled at an unknown quantity, and the spill was discovered during closure activities.

Westlake Companies, UT #0013618, closed several tanks in 1993 and submitted a Closure Report dated June 14, 1993, under ESP File # LU3874. Seven tanks were identified as present, and the report indicated the tanks were numbered by the MDNR as #1, #2, #4 – #6, #8, and #11. These were equivalently identified as tanks #1 through #7 by Westlake Companies. Figures included in the June 14, 1993 report indicate that tanks 5 and 6 were located between the landfill office building and the demolition fill area. Tanks 1, 2, and 3 were located under the conveyor of the concrete plant. Tank #7 was located at the asphalt batch plant and is the tank of concern. The June 14, 1993 report described tank #7 (MDNR tank #11) as a 10,000 gallon steel tank that held diesel fuel. Soil sampling conducted during removal of tank #7 (MDNR tank #11) yielded TPH at 13,270 mg/kg, plus benzene (0.131 mg/kg), toluene (0.24 mg/kg), ethylbenzene (4.04 mg/kg), and xylenes (4.26) mg/kg).

In a June 25, 1993 telephone record, Steve Johnston of the MDNR noted that he spoke with Pat Reeves with ADR (LU3874) and agreed that the most urgent issues were a limited assessment in and around the former tank excavations for T4 and T7, an investigation of the depth of groundwater in these areas to see if groundwater is or has been affected, and sample the T7 backfill to determine contamination levels.

In a July 6, 1993 letter from Mr. Larry Coen of the MDNR to Mr. Pat Reeves of ADR/St. Louis, the MDNR noted receipt of the UST Closure Report for ESP File No. LU3874. The MDNR stated that it was looking forward to ADR's Assessment Plan proposal to follow in the upcoming weeks.

In a November 17, 1993 telephone record, Anita Schroeter of the MDNR noted that she spoke with Pat Reeves regarding the position Westlake was considering for LU3874. According to the telephone record, Mr. Reeves spoke of requesting a health risk assessment, the possibility that the site would be included as part of the EPA radioactive site, and that uranium had been found in the groundwater at relatively low levels.

In a December 6, 1993 letter from Pat Reeves of ADR to Ms. Schroeder (sic) of the MDNR, Mr. Reeves noted that Westlake Companies authorized ADR to initiate data compilation for possible interim remedial and site characterization directed towards Tank #4, 6, and 7, which indicated levels in excess of the soil cleanup levels.

In a December 20, 1993 telephone record, Anita Schroeter of the MDNR noted that she spoke with Pat Reeves (LU3874) regarding receipt of ADR's December 6, 1993 letter. Ms. Schroeter noted that some monitoring wells had been constructed, and some of the

wells indicated free product. Maryon Industries was identified as the current leasor, and may assist in some of the cleanup.

In a January 10, 1994 letter from C. Dean Martin of the MDNR to Mr. B. Whitaker of Westlake Companies (ESP File No. LU3874), the MDNR stated that cleanup levels submitted in the Closure Report were not acceptable because coarse soil and sand is present. The MDNR requested information to include the name, address, and telephone number of the EPA Agent who was heading an EPA investigation regarding low levels of radioactive materials in groundwater. The MDNR noted that the goal to implement an interim remedial system indicated a positive step towards controlling the migration of remaining contamination, but that aggressive measures should be taken to complete the characterization. The MDNR requested submittal of an investigation report by the end of January 1994.

In a February 15, 1994 letter from C. Dean Martin of MDNR to Mr. B. Whitaker of Westlake Companies (ESP File No. LU3874), the MDNR noted that it had not received the December 1993 investigation report or other information requested in the January 10, 1994 letter. The MDNR noted it had been informed that Westlake Companies intended to cease operations as of December 31, 1993, but that as former owner and last operator of the closed tanks, it was the responsibility of Westlake Companies to clean up contamination.

In a February 15, 1994 letter from Pat Reeves of ADR to Anita Schroeter of MDNR, Mr. Reeves noted that severe weather conditions during the past few months (below freezing temperatures and periods of ice and snow) had presented problems with attempting to develop reliable field data. Mr. Reeves stated that the Westlake Quarry and Material Company site did not involve activity associated with the low-level radionuclide investigation, and that a preliminary screening was conducted for the presence of radioactive materials in the work site areas, the results of which indicated "no elevated levels" above normal background readings.

Under cover of a March 18, 1994 letter, Mr. Pat Reeves of ADR submitted to Ms. Schroeter of MDNR a topographic map depicting the locations of four recently installed monitoring wells, borehole logs, and analytical summary tables of soil and water. The analytical summary tables indicated TPH results at Well #4 (located near the asphalt plant UST location; Former Tank #7) of 661,935 mg/l during drilling, and 748,593 mg/l in a sample collected on December 22, 1993. These compared to soil results of 13,326 mg/kg in the Closure Report and 26,225 mg/kg in a drilling sample.

In an April 1, 1994 letter from C. Dean Martin of MDNR to B. Whitaker of Westlake Companies (ESP File No. LU3874), the MDNR noted that it was looking forward to a proposal to define the nature and extent of soil and groundwater contamination. The MDNR further reiterated that efforts should be taken to capture any free product in the vicinity of Well #4.

In a May 12, 1994 UST Flood Impact Assessment Form for Westlake Quarry & Material Company (LU#03874), 10 tanks were noted as formerly present at the site, with the ninth tank removed in December of 1993 and one tank purchased by Laidlaw and out of service but in ground. No flooding was noted, with no visible damage caused by flood.

In a June 28, 1994 letter, Mr. Alan Reinkemeyer of the MDNR requested that Mr. B. Whitaker provide an update for the Westlake site (ESP File No. LU#3874). The letter requested submittal of a project status report focused on efforts made to define the extent of soil and groundwater contamination.

Mr. Pat Reeves of ADR submitted to Ms. Schroeter of MDNR a report dated July 26, 1994 which provided a project status update. The July 26, 1994 report noted that corrective action was implemented at Well #1 (former Tank #6, near the landfill office) by means of re-excavating the former UST area. The July 26, 1994 report stated that activities would be focused on further investigation of the existing conditions at Well #4 (former Tank #7, near the asphalt plant).

In an August 22, 1994 letter from Mr. Alan Reinkemeyer of MDNR to Mr. B. Whitaker of Westlake Companies (ESP File No. LU#3874), the MDNR noted excessive TPH contamination in the vicinity of Well #4. The MDNR stated that the contaminant concentrations warranted further investigation to include downgradient sampling and subsequently a corrective action plan. The MDNR requested submittal, within 30 days, of a proposal to define the extent of contamination.

An October 12, 1994 report from Schreiber, Grana & Yonley, Inc. titled "Subsurface Environmental Site Investigation Work Plan, Maryon Industries, Inc. Westlake Asphalt Plan, LU #3874" (Work Plan) was addressed to Mr. Vincent Jones, President, Maryon Industries. The Work Plan included a proposal to drill four soil borings to depths of about 35 feet below ground surface, install four groundwater monitoring wells, and collect and analyze soil and groundwater samples for purposes of identifying the extent of impact, potential sources, and need or scope of additional work.

A November 19, 1994 fax cover sheet from Schreiber, Grana & Yonley, Inc. to Mr. Dave Bellamy provided a figure noting free product in monitoring well MW-1A, located south/southeast of the former Tank #7 location.

In a November 22, 1994 letter from Mr. Alan Reinkemeyer of MDNR to Mr. B. Whitaker of Westlake Companies (ESP File No. LU#3874), the MDNR stated that the reported free product/contamination warranted further investigation to delineate the horizontal and vertical extent of the plume, and inquired whether or not the tank pit was a direct conduit to groundwater. The letter further noted that an initial free product recovery report was required within 45 days of confirming the release, and that the initial free product recovery report should be followed by monthly written reports providing information on free product recovery activities and any changes made to enhance the rate of recovery.

In a December 9, 1994 letter from Pat Reeves of ADR to Mr. Bellamy with the MDNR, Mr. Reeves noted that of 80 gallons collectively removed from Well #4, less than 5 gallons was recognized as recovered product.

In a January 10, 1995 letter from Mr. Alan Reinkemeyer of MDNR to Mr. B. Whitaker of Westlake Companies (ESP File No. LU#3874), the MDNR noted that it had not received the required free product recovery reports pertaining to monitoring well No. 1A, as mandated by 10CSR20-10.064. The MDNR stated that since the initial free product recovery and monthly reports have missed their suspense dates, the LUST unit will require a status update covering all site activities. The requested information was to be supplied to the MDNR within 15 days of receipt of the January 10, 1995 letter.

In a January 11, 1995 letter, Mr. Edward Shepard Jr. of Schreiber, Grana & Yonley, Inc. provided a free product notification letter to Mr. Dave Bellamy of the MDNR and summarized the results of investigatory activities at the site. The January 11, 1995 letter noted that anticipated soil cleanup objectives for BTEX would be 1/5/10/10 ppm, respectively, and the TPH cleanup objective would be 200 ppm. The soil cleanup objectives were based on the MDNR's "Leaking Underground Storage Tank Soil Cleanup Guidelines". The letter noted that the soil cleanup objective for xylenes was exceeded at MW-1A, and the soil cleanup objective for TPH was exceeded in MW-1A and MW-4A. Utilizing the MDNR's "Underground Storage Tank Closure Guidance Document" dated January 1992, groundwater cleanup objectives for BTEX were listed as 0.050/0.150/0.320/0.320 ppm, respectively; the groundwater cleanup objective for total BTEX was 0.750 ppm, and the groundwater cleanup objective for TPH was 10 ppm. The January 11, 1994 letter stated that the TPH cleanup objective was exceeded in the sample collected from MW-4A, and MW-1A was not sampled due to the presence of free product in the well. One additional monitoring well was proposed to further delineate BTEX and TPH. A figure attached to the January 11, 1995 letter indicated that the additional well was to be installed southeast of MW-1A, and was to be called MW-5A.

A January 13, 1995 letter from Pat Reeves of ADR to D. Bellamy of the MDNR provided groundwater sample results for wells referred to as well #1 and well #2. The January 13, 1995 letter reiterated an understanding that the MDNR would allow closure of wells #1 and #2 provided that TPH analytical results for four quarterly sampling events remained below 10 parts per million.

In a February 7, 1995 letter from Mr. Alan Reinkemeyer of MDNR to Mr. Vince Jones of Maryon Industries, Inc. (ESP File No. LU#3874), the MDNR approved the additional monitoring well to determine the overall extent of the plume. However, the February 7, 1995 letter also stated that one additional monitoring well would not satisfy MDNR's overall site characterization of the soil and water requirements. The letter noted that the LUST unit would require Maryon Industries, Inc. to fully define, both vertically and horizontally, the extent of the contamination.

A February 7, 1995 report from Schreiber, Grana & Yonley, Inc. titled "Free Product Recovery Report, January 1995, Maryon Industries, Inc., MDNR ESP File No. LU3874" noted recovery of approximately 1.037 gallons of product from MW-1A during January 1995.

In a March 9, 1995 letter from Mr. Alan Reinkemeyer of MDNR to Mr. Vince Jones of Maryon Industries, Inc. (ESP File No. LU#3874), the MDNR requested submittal of a site characterization plan within 45 days of receipt of the letter.

A March 21, 1995 report from Schreiber, Grana & Yonley, Inc. titled "Free Product Recovery Report, February 1995, Maryon Industries, Inc., MDNR ESP File No. LU3874" noted recovery of approximately 0.550 gallons of product during February.

A May 1, 1995 report from Schreiber, Grana & Yonley, Inc. titled "Free Product Recovery Report, March 1995, Maryon Industries, Inc., MDNR ESP File No. LU3874" noted recovery of approximately 0.154 gallons of product during March. The May 1, 1995 referenced five monitoring wells, including MW-5A.



In a May 17, 1995 letter from Mr. Alan Reinkemeyer of MDNR to Mr. Vince Jones of Marion (sic) Industries, Inc. (ESP File No. LU#3874), the MDNR reiterated its request for a site characterization work plan, and requested submittal of the work plan within 30 days of receipt of the May 17, 1995 letter.

A June 6, 1995 letter from Schreiber, Grana & Yonley, Inc. titled "Free Product Recovery Report, April 1995, Maryon Industries, Inc., MDNR ESP File No. LU3874" noted recovery of approximately 0.85 gallons of product during April.

A June 7, 1995 letter from Schreiber, Grana & Yonley, Inc. titled "Free Product Recovery Report, May 1995, Maryon Industries, Inc., MDNR ESP File No. LU3874" noted recovery of 0.302 gallons of product during May.

A June 21, 1995 letter from Edward Shepard Jr. of Schreiber, Grana & Yonley, Inc. to Dave Bellamy of MDNR notified the MDNR of additional investigatory activities at the Maryon Industries, Inc., Westlake Asphalt Plant, UST #7 (MDNR #11), LU#3874. The June 21, 1995 letter stated that well MW-5A was installed on March 24, 1995, and of two soil samples analyzed one of them exceeded the MDNR soil cleanup objective for TPH. The June 21, 1995 letter noted that groundwater samples were collected from monitoring wells MW-1A through MW-5A, and TPH groundwater cleanup objectives were exceeded in wells MW-1A and MW-5A.

In a June 30, 1995 letter from Mr. Alan Reinkemeyer of MDNR to Mr. Vince Jones of Maryon Industries, Inc., the MDNR requested submittal of a corrective action plan based on excessive soil and groundwater contamination detected in the vicinity of MW-1A, MW-4A, and MW-5A. The MDNR requested submittal of the corrective action plan within 45 days of receipt of the June 30, 1995 letter.

In a March 5, 1998 letter from Mr. Jim Growney of the MDNR to Mr. Vince Jones of Maryon Industries, Inc., the MDNR requested a project status report within 45 days of receipt of the letter.

An April 22, 1998 letter from Schreiber Yonley & Associates to Mr. Marty Kasper of the MDNR provided a project status update. The April 22, 1998 letter noted that product recovery continued from MW-1, and that one groundwater sample was planned to be collected from each on-site monitoring well. Based on Product Recovery Logs attached to the April 22, 1998 letter, as much as 30 inches of product were measured in well MW-1A.

In a May 18, 1998 letter, Schreiber Yonley & Associates submitted to Mr. Marty Kasper of MDNR a scope of work for sampling on-site groundwater monitoring wells at the Maryon Industries, Inc. facility. The scope of work called for analysis of BTEX and MTBE.

In a May 20, 1998 letter from Mr. Jim Growney of MDNR to Mr. Vince Jones of Maryon Industries, MDNR noted that the amount of product observed in monitoring well MW-1 indicated the problem is not attenuating. The May 20, 1998 letter requested submittal of a corrective action plan within 60 days, selecting a more aggressive approach to product recovery.

In a letter dated November 13, 1998, Mr. Jim Growney of MDNR responded to the May 18, 1998 scope of work. Mr. Growney indicated to Mr. Vince Jones of Maryon Industries that the work plan was approved. The November 13, 1998 letter further noted that the extent of groundwater contamination to the east of MW-4A was not completely defined. The MDNR requested a work plan for further investigation of soil and groundwater contamination east of MW-4A, and also requested submittal of a corrective action plan for more aggressive product recovery from MW-1 as requested in the MDNR's letter dated May 20, 1998.

In a January 8, 1999 letter from Mr. William Werner of the Stolar Partnership to Mr. David Pate of Williams & Company, Mr. Werner discussed the eligibility of the tank closure for reimbursement under the Missouri Petroleum Storage Tank Insurance Fund. An attachment to the January 8, 1999 letter noted that MDNR Tank #11 exhibited multiple holes on endcaps and lower seams when excavated. A copy of the January 8, 1999 letter and attachments was apparently forwarded to Mr. Jim Growney of MDNR.

A January 13, 1999 letter from Mr. David Pate of the Missouri Petroleum Storage Tank Insurance Fund to Mr. Vince Jones of Maryon Industries stated that the site was eligible to receive benefits from the Petroleum Storage Tank Insurance Fund. The January 13, 1999 letter authorized the site to perform groundwater monitoring activities.

A June 14, 1999 report from Schreiber, Yonley & Associates titled "Quarterly Groundwater Monitoring Report, April 13, 1999, Maryon Industries, Inc., ST0013618, R0003874", prepared for Mr. Mike Jones of Maryon Industries, Inc. stated that liquid phase hydrocarbons were measured in MW-1A at a thickness of 3.71 feet. The report stated that groundwater TPH cleanup objective was exceeded in monitoring wells 1A, 4A, and 5A.

In a July 8, 1999 letter from Mr. Jim Growney of the MDNR to Mr. Vince Jones of Maryon Industries, the MDNR stated that significant contamination still existed in the area of monitoring wells MW-1A, MW-4A, and MW-5A. The MDNR further requested an explanation for the delay in submittal of a corrective action plan for more aggressive product recovery.

An August 16, 1999 letter from Amy Stewart of Schreiber, Yonley & Associates to Mr. Hugh Murrell of MDNR requested a 30-day extension for submittal of a corrective action plan for aggressive product recovery from MW-1A.

An August 27, 1999 letter from Mr. Jim Growney of MDNR to Mr. Vince Jones of Maryon Industries approved a 30-day extension for submittal of a corrective action plan.

In a September 24, 1999 letter from Mr. Edward Shepard Jr. of Schreiber, Yonley & Associates to Mr. Hugh Murrell of MDNR, a scope of work for free product recovery was submitted. The scope of work included installation of a product recovery pump in MW-1A, along with submittal of monthly free product recovery reports, plus quarterly groundwater monitoring for TPH, BTEX, and MTBE.

In an October 12, 1999 letter from Mr. Jim Growney of MDNR to Mr. Vince Jones of Maryon Industries, the MDNR approved the September 24, 1999 Work Plan.

A December 15, 1999 letter from Mr. David Pate of the Missouri Petroleum Storage Tank Insurance Fund to Mr. Vince Jones of Maryon Industries stated that the site was eligible to receive benefits from the Petroleum Storage Tank Insurance Fund. The December 15, 1999 letter authorized free product recovery, free product recovery monitoring, and quarterly groundwater monitoring.

In a February 7, 2001 letter from Mr. Jim Growney of the MDNR to Mr. Vince Jones of Maryon Industries, the MDNR requested submittal of additional information within 30 days.

In a September 5, 2001 Letter of Warning from Mr. Jim Growney of MDNR to Mr. Vince Jones of Maryon Industries (ST0013618, R0003874), the MDNR noted that there was a February 7, 2001 letter requesting an update on the proposed free product recovery and quarterly groundwater monitoring that was approved by the department on October 12, 1999. The September 5, 2001 letter noted that to date, the department had not received any documentation that the work had been performed.

In a January 25, 2002 letter from Mr. Edward Shepard Jr. of Schreiber, Yonley & Associates to Mr. Terry Hawkins of MDNR, Schreiber, Yonley & Associates reiterated that a work plan dated September 24, 1999 was approved by MDNR, and that Maryon Industries was currently in the process of acquiring the free product recovery pump. **In a table attached to the January 25, 2002 letter, a product thickness of 2.22 feet was noted in MW-1A based on October 30, 2001 measurements.**

A July 19, 2002 letter from Mr. Bryan Elledge of Schreiber, Yonley Associates to Mr. Terry Hawkins of MDNR discussed the project status. The July 19, 2002 letter noted that on July 16, 2002 the facility and operations of the asphalt plant were transferred to Simpson Construction Materials, LLC (Simpson), and they had assumed responsibility to continue the investigation and corrective action activities associated with the site. The July 19, 2002 letter indicated that a free product recovery and groundwater monitoring work plan was submitted in 1999, the MDNR approved the work plan in correspondence dated October 12, 1999, and that the Missouri Petroleum Storage Tank Insurance Fund approved the budget in correspondence dated December 15, 1999. The July 19, 2002 letter stated that the activities approved in the work plan would now be performed under the direction of Simpson.

In an August 19, 2002 letter from Mr. Fred Huston of MDNR to Mr. Mark Simpson of Simpson Construction Materials, LLC, the MDNR requested submittal of the groundwater monitoring and free product recovery report that was approved by the department.

In a September 1, 2004 letter from the MDNR (no signature provided) to Mr. Mark Simpson of Simpson Construction Materials, LLC, the MDNR requested submittal of the groundwater monitoring and free product recovery report that was approved by the department. The MDNR noted that it had previously requested submittal of the report in letters dated February 7, 2001 and August 19, 2002.

A February 1, 2005 letter from Edward Shepard of Schreiber, Yonley & Associates to Mr. David Fulbright of the Missouri Petroleum Storage Tank Insurance Fund provided a Work Plan for additional site characterization activities. The Work Plan was prepared to

provide information consistent with the Missouri Risk-Based Corrective Action guidance for site characterization at petroleum release sites.

In a March 29, 2005 letter from Mr. David Walchshauser of the MDNR to Mr. Mark Simpson of Simpson Construction Materials, the MDNR denied the February 1, 2005 Work Plan. The denial was based on incompleteness and failure to provide basic information required to complete a review of the plan. The MDNR requested resubmittal of the Work Plan within 60 days.